
# Closure Cost Estimating Tool
# *Version: 1.1*
# User Guide

Washington State Department of Ecology
Hazardous Waste and Toxics Reduction Program
Publication # 05-04-009
May 2005

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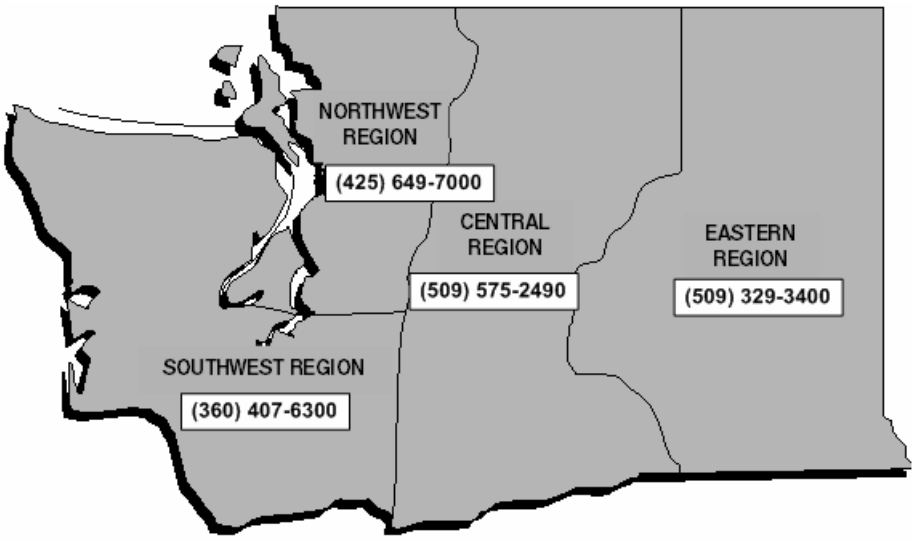


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# SECTION 1: Introduction to Closure Cost Estimating Tool

## About Closure Cost Estimating Tool

Closure Cost Estimating Tool (CCET) was developed by the Washington State Department of Ecology (Ecology) in collaboration with Ross & Associates Environmental Consulting Ltd. CCET is expected to be used to assist the owner/operators of smaller and/or less complicated facilities, such as dangerous waste recycling and used oil facilities, to develop their closure cost estimates and reduce the financial and administrative burden associated with the process. CCET attempts to cover the main closure cost estimate items Ecology, in most circumstances, would expect the facility to encounter and provides a standardized methodology for facilities to itemize their closure cost activities and assign costs. CCET was developed using Microsoft Excel© and is made up of a series of linked worksheets that use information collected from the user in conjunction with cost data to create cost estimates. CCET assumes that a third party will be performing the closure work.

## About the CCET User Guide

The CCET user guide is intended to be a companion document to the CCET tool. This guide provides an overview of the methodology used by CCET, the user interface and step by step instructions on how facilities can use CCET to develop closure cost estimates. The guide assumes that users have basic knowledge about Microsoft Excel and does not provide guidance on how to use Excel. The CCET user guide only describes how to utilize the worksheets. The guide uses a series of diagrams and screenshots from the CCET software to walk the user through the user interface and the steps involved in computing a closure cost estimate.

## Methodology

CCET assumes that all or most facility units will fall into two predefined categories - Container Storage Areas and Tank Systems. In addition, CCET allows users to define closure activities that do not fall into either of these pre-defined categories. CCET is based on the methodology developed by the US EPA Office of Solid Waste and described in the 1998 document "Closure Cost Estimates for Standardized Permits: Background Document - Option 4."[1]

CCET uses the following approach to compute closure cost estimates:

1. The user completes an inventory sheet by filling in information about the facility infrastructure for container storage areas and tank systems.
2. This facility information is then automatically populated in supporting worksheets.

[1] http://www.epa.gov/epaoswer/hazwaste/permit/std-perm.htm

3. The supporting worksheets have been prepared with cost information.
4. The inventory information and the cost information are used in conjunction to calculate cost estimates.
5. The users have the opportunity to define their own closure activities if they do not fit into any of the predefined unit categories.
6. A final closure cost estimate summary is generated which includes the third party cost of closure of predefined and user defined units.

## SECTION 2: CCET Structure and Components

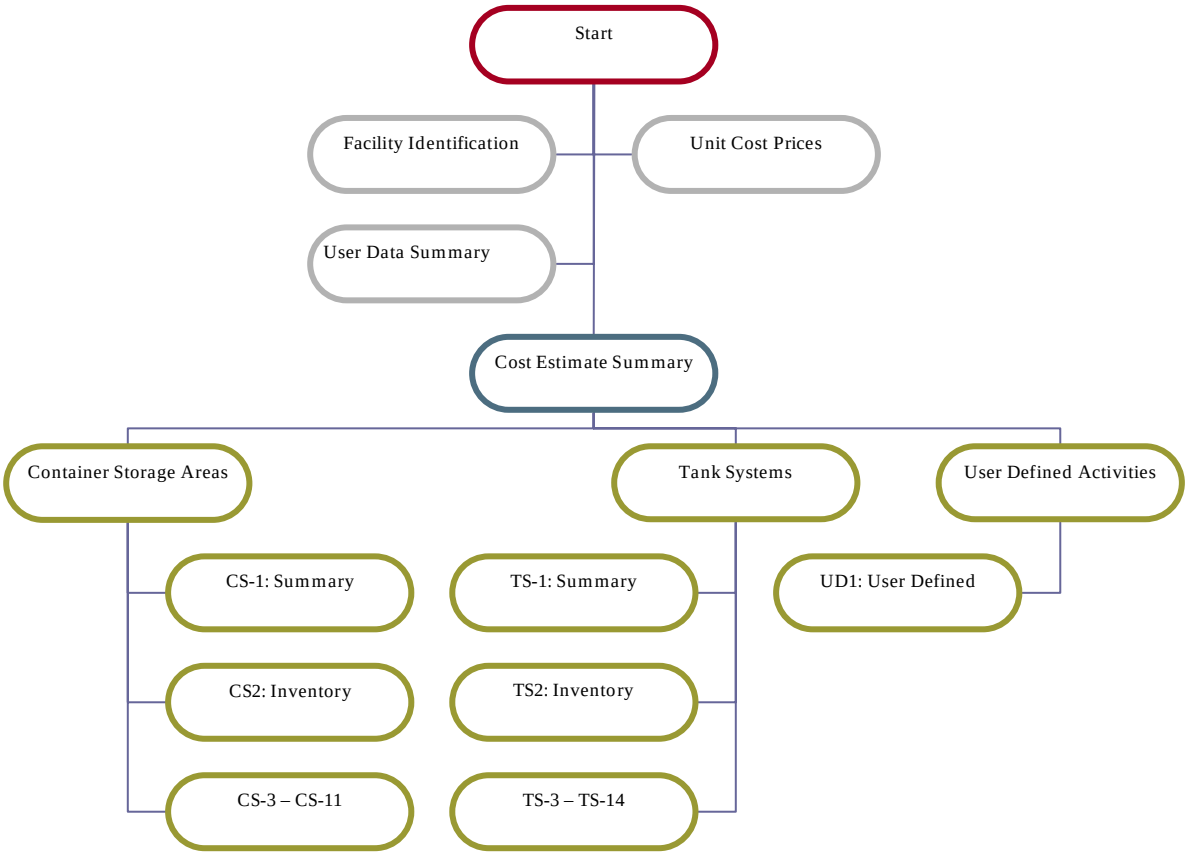



**Figure 1: CCET Schematic**

As shown in Figure 1, the CCET has the following areas:

1. **Start Page (Tab: "Start")**
   The Start worksheet provides users with a schematic overview of the entire tool. Users can navigate to different worksheets by clicking on the name of the worksheets in the schematic.

2. **Facility Identification Information (Tab: "FacilityID")**
   This worksheet is used to collect information about the facility and the owner/operator.

3. **Cost Estimate Summary Sheet (Tab: "Summary")**
   The Cost Estimate Summary Sheet adds the closure costs from the two predefined unit types – Container Storage Areas and Tank Systems - and from the User Defined Units. These costs are imported from other parts of the CCET tool; no user input is required. The first three digits from the facility location zip code are used to calculate the localization factor[2] for the closure costs. All costs in CCET are bare national averages. Material, labor and equipment costs can be adjusted on the basis of their location by multiplying the bare national cost by the localization factor. The localization factor is applied to the final summary costs in the "Summary" worksheet.

### 3.1. Container Storage Areas (CS) (Tabs: "CS-1" to "CS-11")

The Container Storage Areas Worksheets help facilities calculate the costs associated with activities most frequently required to conduct the following closure activities:

- Removal of Waste - This activity includes preparing the containers and loading them onto trucks for shipment.

- Decontamination of the Containment System and Equipment - This activity includes decontaminating the unit and the heavy equipment that is used to close the unit. The unit decontamination worksheets allow for

[2] Localized Cost = Bare National Cost X Localization Factor.
Localization Factor for Washington State taken from R.S. Means, Environmental Remediation Cost Data – Unit Price, 11th Annual Edition, 2005 (pages 1-33).

decontamination by one of two methods: (1) steam cleaning or pressure washing or (2) sandblasting / scarification.[3] The equipment decontamination worksheet assumes the use of steam cleaning or pressure washing to decontaminate heavy equipment that may come into contact with hazardous waste while conducting closure activities.

» Sampling and Analysis - This activity includes all sampling and analysis of wastes, waste residues, decontaminated structures and contaminated environmental media to be conducted during closure. Sampling and analysis will be needed to verify that decontamination efforts have been successful. Factors to be considered in estimating the costs of sampling and analysis include the number and types of samples to be collected and the methods to be used to analyze those samples.

» Transportation of Wastes - This activity includes transportation of all wastes by a third party. Types of wastes transported may include inventoried wastes and contaminated components of the containment system.

» Treatment and Disposal of Wastes - This activity includes treatment and disposal of all wastes by a third party. The wastes to be treated and disposed of may include inventoried wastes, contaminated components of the containment system, and wastes resulting from decontamination activities. A separate worksheet is provided specifically to estimate the costs of transporting, treating, and disposing of decontamination fluids.

» Inspection and Certification of Closure - This activity includes professional and administrative fees for conducting closure inspections and preparing the certification of closure report. If multiple units of the same type are being closed in the same manner and at the same time, the user may choose to account for the cost of certification of closure only once for all of those units.

[3] See the requirements for scarification in the Alternative Treatment Standards of Hazardous Debris, 40 CFR 268.45, Table 1.

Presented below are descriptions of cost estimating worksheets for certain additional activities that might be conducted to effect closure at container storage areas:

» Demolition and Removal of the Containment System - Demolition and removal of the containment system are additional activities that might be conducted if the owner or operator intends, or will be required, to demolish and remove the system at the time of closure.

» Removal of Contaminated Soils - Removal of contaminated soils is an additional activity that might be conducted at the time of closure.

» Backfilling - The cost of backfilling should be included in the cost estimate when areas are excavated to remove components of the containment system or to remove contaminated soil.

### 3.2. Tank Systems (TS) (Tabs: "TS-1" to "TS-14")

The Tank Systems Worksheets help facilities calculate the costs associated with activities most frequently required to conduct the following closure activities:

» Removal of Waste - This activity includes pumping the waste out of the tank and all ancillary piping and placing it in trucks for shipment off site.

» Purging of the Tank System - This activity includes introducing carbon dioxide (dry ice) into tanks that have contained ignitable wastes and purging them of all volatile vapors.

» Decontamination of the Tank System and Equipment - This activity includes decontaminating the unit and the heavy equipment that is used to close the unit. The unit decontamination worksheets allow for decontamination by one of two methods: (1) steam cleaning or pressure

washing or (2) sandblasting / scarification.[4] The equipment decontamination worksheet assumes the use of steam cleaning or pressure washing to decontaminate heavy equipment that may come into contact with hazardous waste while conducting closure activities.

» Sampling and Analysis - This activity includes all sampling and analysis of wastes, waste residues, decontaminated structures and contaminated environmental media activities to be conducted during closure. Sampling and analysis will be needed to verify that decontamination efforts have been successful. Factors to be considered in estimating the costs of sampling and analysis include the number and types of samples to be collected and the methods to be used to analyze those samples.

» Transportation of Wastes - This activity includes transportation of all wastes by a third party. The wastes transported may include: (1) inventoried wastes, (2) wastes resulting from flushing the tank and ancillary piping, (3) contaminated components of the tank system, and (4) contaminated components of the containment system.

» Treatment and Disposal of Wastes - This activity includes treatment and disposal of all wastes by a third party. The wastes to be treated and disposed of may include: (1) inventoried wastes, (2) wastes resulting from flushing the tank and ancillary piping, (3) wastes resulting from decontamination activities, (4) contaminated components of the tank system, and (5) contaminated components of the containment system. A separate worksheet is provided specifically to estimate the costs of transporting, treating, and disposing of decontamination fluids.

» Inspection and Certification of Closure - This activity includes professional and administrative fees for conducting closure inspections and preparing the certification of closure report. If a number of units of the same type are being closed in the same manner and at the same time,

[4] See the requirements for scarification in the Alternative Treatment Standards of Hazardous Debris, 40 CFR 268.45, Table 1.

the user may choose to account for the cost of certification of closure only once for all those units.

Presented below are descriptions of cost estimating worksheets for certain additional activities that might be conducted to close tank systems:

» Flushing the Tank and Ancillary Piping - This activity includes flushing the tank system and ancillary piping with water or a mixture of soap and water to remove residues of hazardous waste. Under certain circumstances, this activity might be done before, or as a substitute for, decontamination of the tank system.

» Disassembly and Loading of the Tank and Ancillary Piping - Disassembly and loading of the tank and ancillary piping are additional activities that might be conducted if the owner or operator intends, or will be required, to disassemble and remove the tank system at the time of closure.

» Demolition and Removal of the Containment System - Demolition and removal of the containment system are additional activities that might be conducted if the owner or operator intends, or will be required, to demolish and remove the system at the time of closure.

» Removal of Contaminated Soils - Removal of contaminated soil is an additional activity that might be conducted at the time of closure.

» Backfilling - The cost of backfilling should be included in the cost estimate when areas are excavated to remove components of the containment system or to remove contaminated soil.

### 3.3. User Defined Units (UD) (Tab: "UD1")

Because it is not possible to standardize the closure activities associated with the unique features of any particular facility, the CCET provides the opportunity to include "user defined units" into the cost calculations. The User Defined Units worksheet is a free-form entry area where users can enter

any additional closure activities and costs that are specific to their unit. The finals costs from this worksheet will be included in the final cost summary.

4. **Unit Cost Prices (Tab: "UnitCosts")**
   This worksheet is for reference purposes only and facilities are not expected to enter any additional information in this area. The worksheet contains unit cost price information compiled from the following sources:

   - R.S. Means, *Environmental Remediation Cost Data – Unit Price*, 11th Annual Edition, 2005
   - R.S. Means, *Building Construction Cost Data*, 63rd Annual Edition, 2005
   - R.S. Means, *Environmental Cost Data – Assemblies*, 11th Annual Edition, 2005

   Additional information on how these costs were computed can be found in Appendix A.

5. **User Data Summary (Tab: "UserData")**
   This worksheet summarizes all of the user input on the different CCET worksheets. This worksheet is intended to be used by users to review the information they have entered as well as by Ecology staff to have an overview summary of the data entered.

## How CCET calculates Cost Estimates

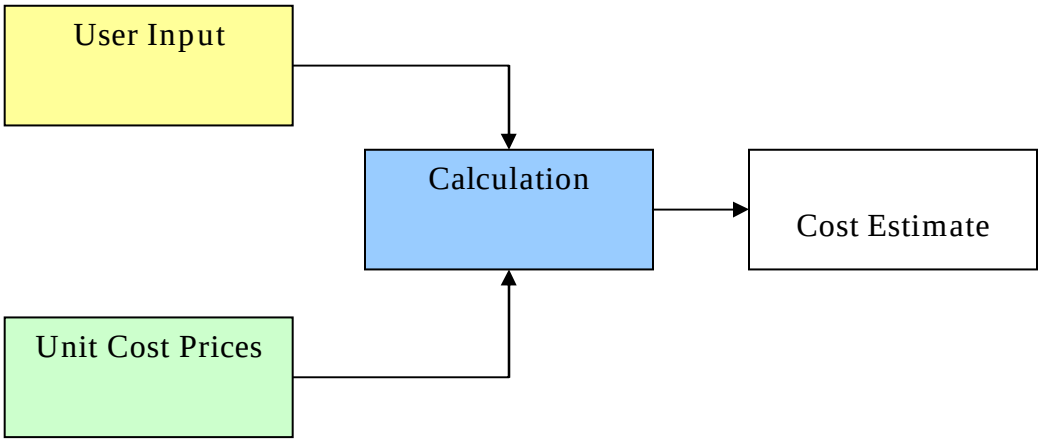



**Figure 2: CCET Cost Estimate Calculations**

CCET typically calculates cost estimates based on three variables:

1. User Input – this is the value or selection made by the user. The user input could either be information about the facility's infrastructure, the level of Personal Protection Equipment (PPE) required, or the type of sampling and analysis to be carried out. See Appendix B for a summary list of all the user input required for CCET.
2. Unit Cost Price data – These values are automatically pulled from the Unit Cost worksheet and in some cases the cost selected will be affected by the user input. (For example, selecting a higher PPE safety level will result in a higher unit cost being used.
3. Calculations – in some cases, CCET will perform calculations on the variables entered by the user in order to make them usable for further operations.

# SECTION 3: CCET User Interface

CCET was designed to be usable by any Microsoft Excel user. It makes use of the standard Excel functions and navigation features and anybody who has a basic understanding of Excel should be able to use the software. However, some interface enhancements, listed below, have been made to improve the user interaction.

## Tabbed Worksheets

Each of the worksheets in CCET is individually named and numbered (for example TS-1, CS-5, etc.). As shown in Figure 3, the users can use tabs at the bottom of the Excel screen to navigate between worksheets:

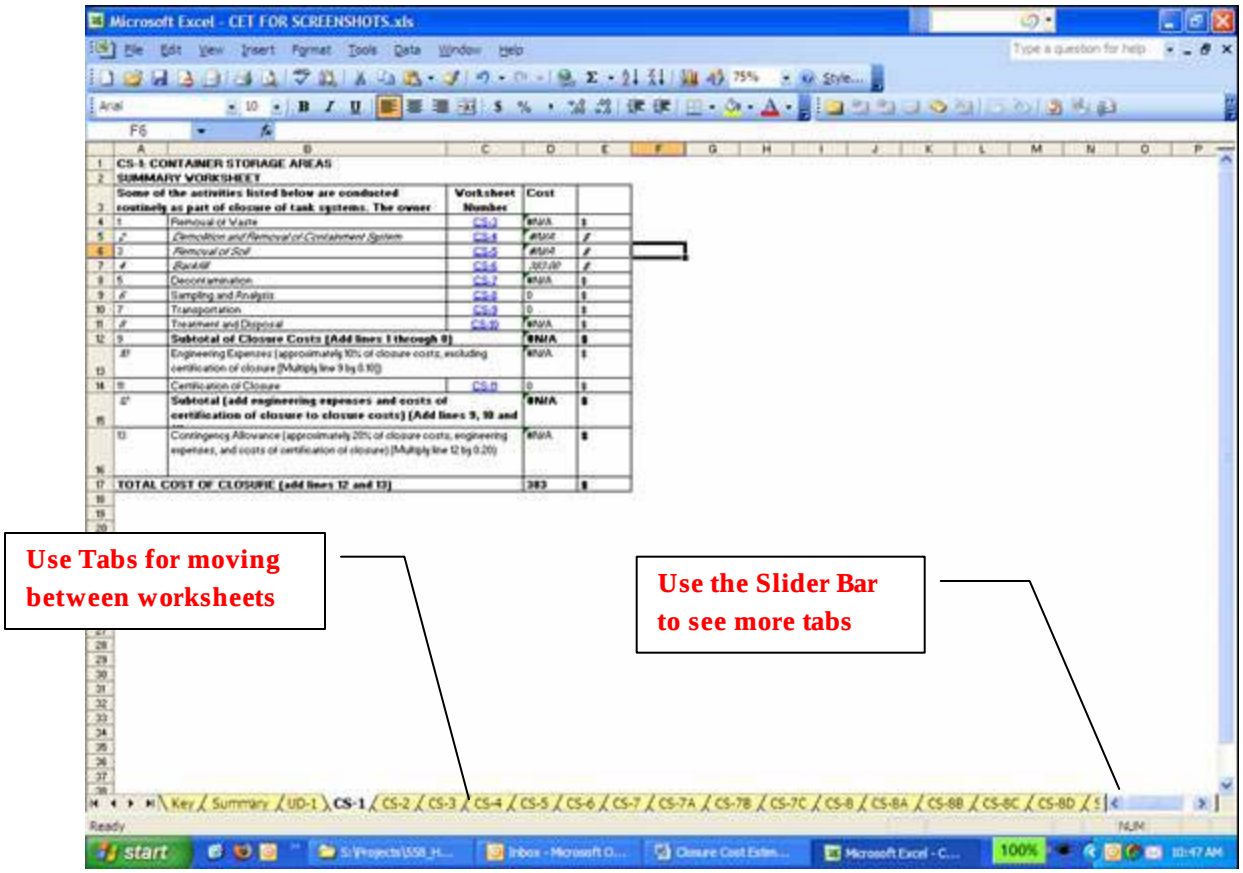



**Figure 3: Tabbed Worksheets**

## Color Coded Cells

CCET uses a consistent color scheme throughout the workbook to give the user an indication of what a particular cell does and where user input is required. There are three types of cells:

Calculation Cells (Blue)

These cells are shaded blue. These cells are used to carry out calculations on data entered by the user or from the unit cost data source. No user input is required in these cells.[5]

[5] These cells, depending on their location and context may carry a number or may read #N / A which means that the cell is waiting for user input at another location to carry out its calculation.

Unit Cost Cells (Green)

These cells are shaded green. These cells are used to pull information from the unit cost data source. No user input is required in these cells.[6]

User Input Cells (Yellow)

These cells are shaded yellow. Users are required to enter data into these cells if the closure activity applies to their facility.

As shown in Figure 4, a typical worksheet will contain all of these types of cells:

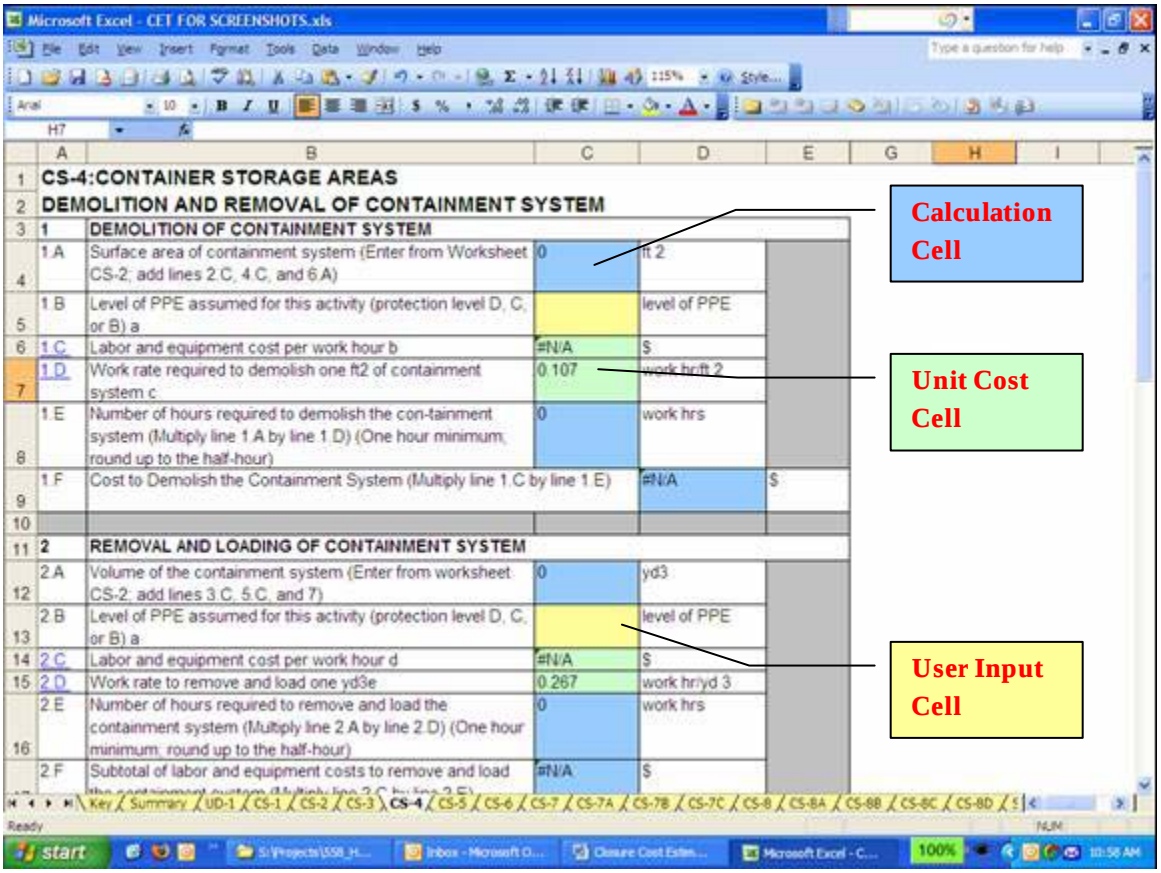



**Figure 4: Color Coded Cells**

[6] These cells, depending on their location and context, may carry a number or may read #N/A which means that the cell needs user input from some other field in order to make a calculation. In most cases the user needs to enter a PPE safety level for the cell to pull the corresponding cost data from the unit cost data source.

To prevent accidental erasure of the formulas or unit cost data source references, the Calculation Cells and the Unit Cost Cells have been locked and will not allow user input. As shown in Figure 5, the user will encounter a warning message if entry is attempted in a locked cell:

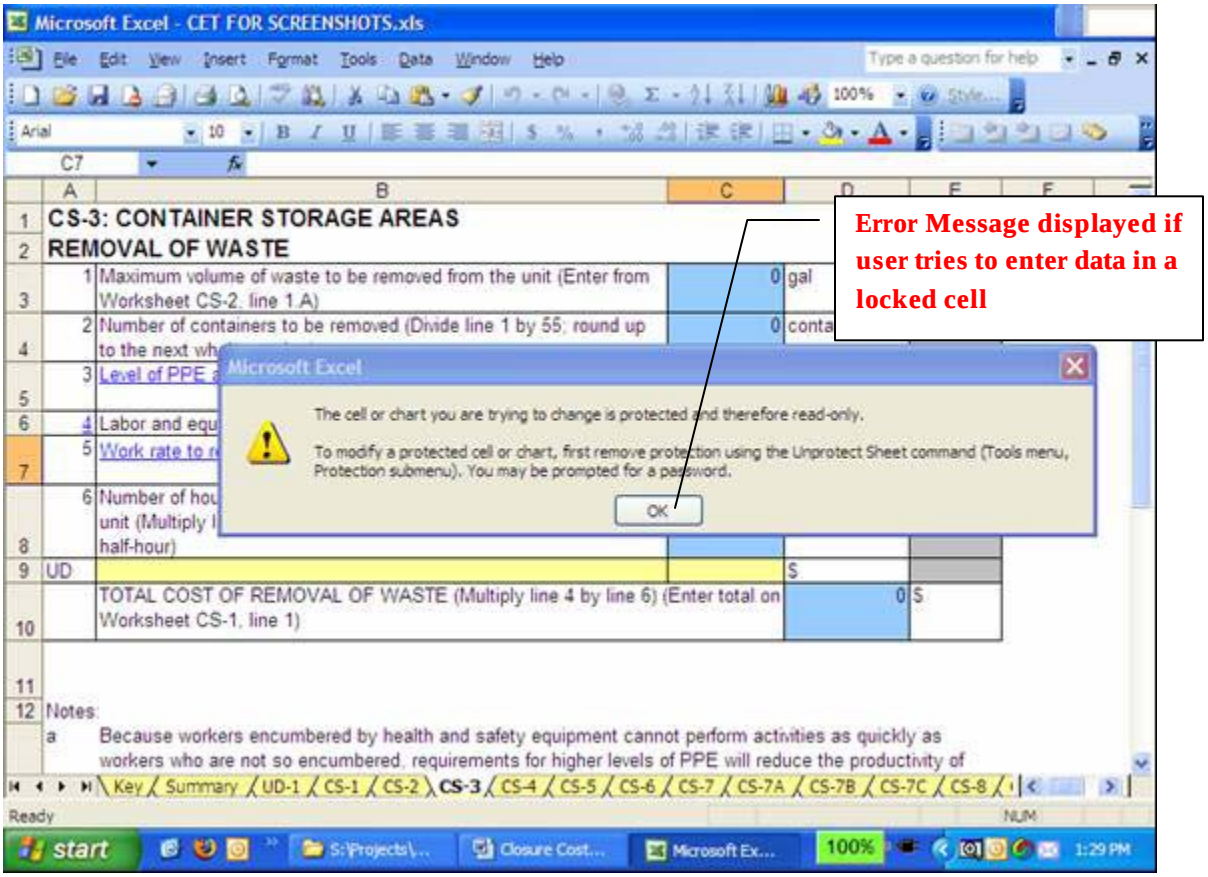



**Figure 5: Locked Cells**

## Special User Input Cells (For Personal Protective Equipment (PPE) Only)

User Input cells (yellow) that select the Personal Protective Equipment (PPE) safety level are treated differently from regular user input cells. The value that a user can enter is restricted and the user has to pick a single predefined value from a pre-populated list. As shown in Figure 6, the list becomes visible as a dropdown menu when the user clicks on an arrow head next to the cell. To remind the user, a yellow box also pops up automatically which tells the user to pick the appropriate PPE level.[7]

[7] The selected PPE level (B, C, or D) determines which unit cost is selected from the unit cost data source. Please see Appendix A for an explanation of the PPE levels.

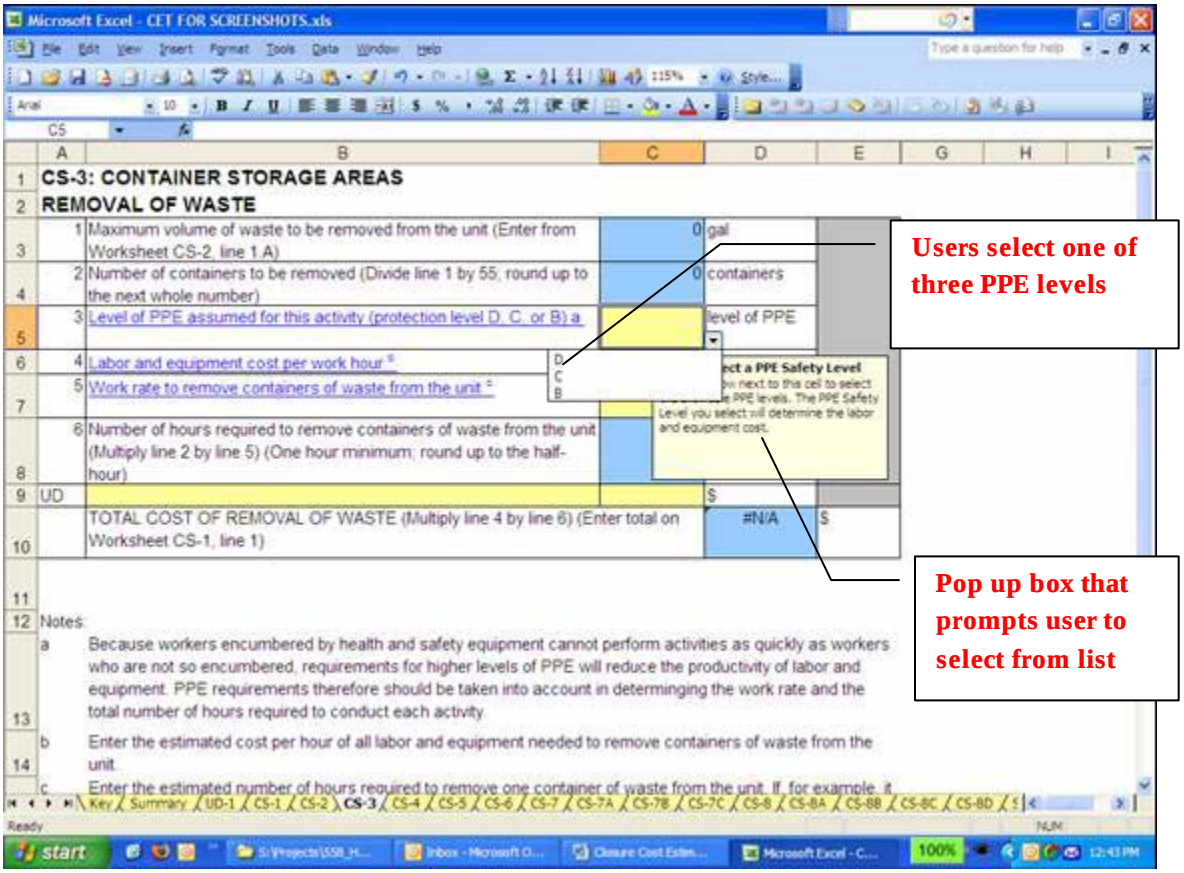



**Figure 6: Special User Input Cells**

## Reference Hyperlink

CCET uses hyperlinks to allow users to quickly move between different worksheets. As shown in Figure 7, hyperlinks are easily identified as blue underlined text.[8] Hyperlinks are use for two primary purposes:

1. To reference a footnote or special instruction.
2. To reference the appropriate section of the unit price data source.

[8] Once a hyperlink has been clicked it will turn violet to indicate that it has been used.

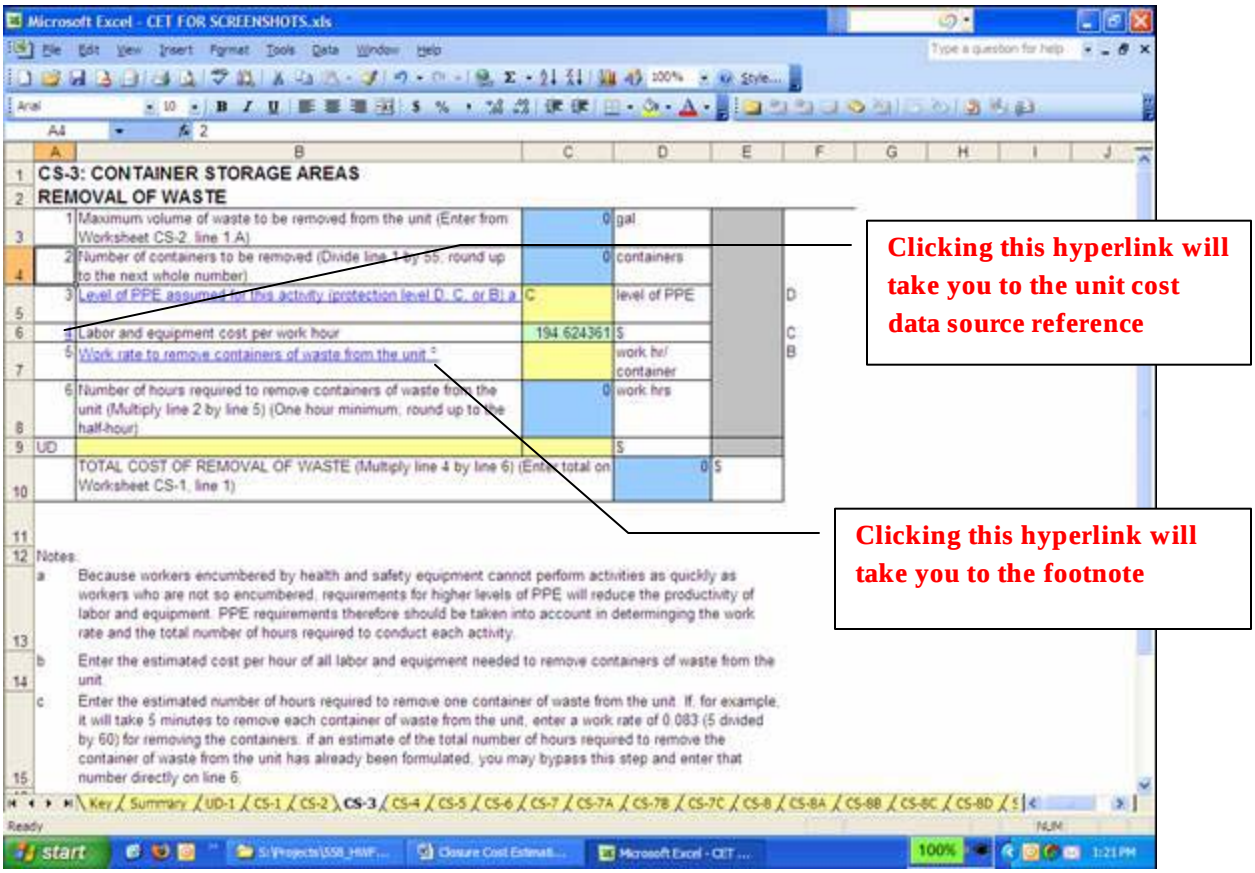



**Figure 7: Reference Hyperlinks**

*Activating and Deactivating worksheets*

Users may not want to use all of the CCET worksheets in their closure cost estimates as all of the closure activities may not pertain to their facility. Users have the option of deactivating spreadsheets which will not be used in order to prevent CCET from including costs for closure activities that will not be conducted. The sheets are activated and deactivated using checkboxes as shown in Figure

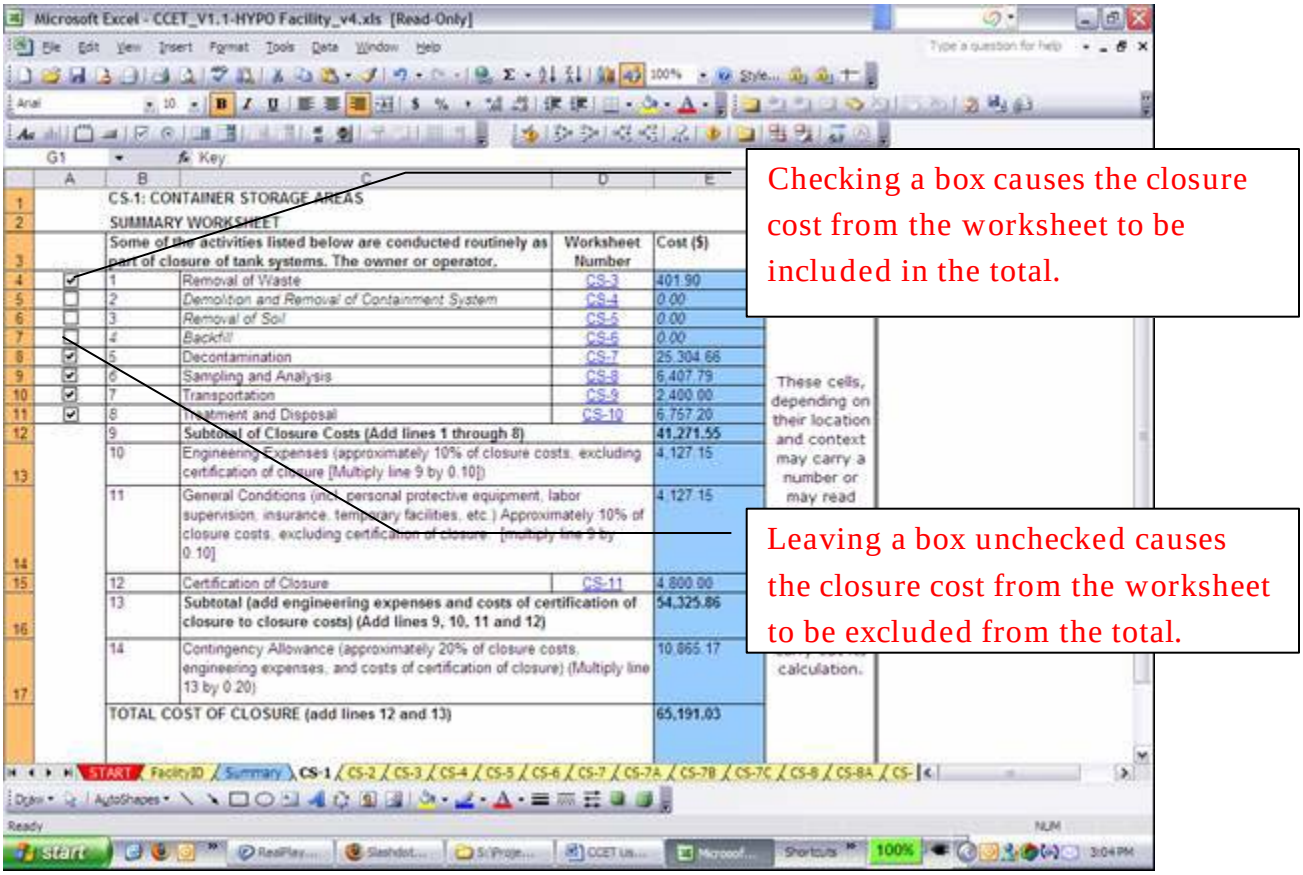



**Figure 8: Deactivating and Activating Worksheets**

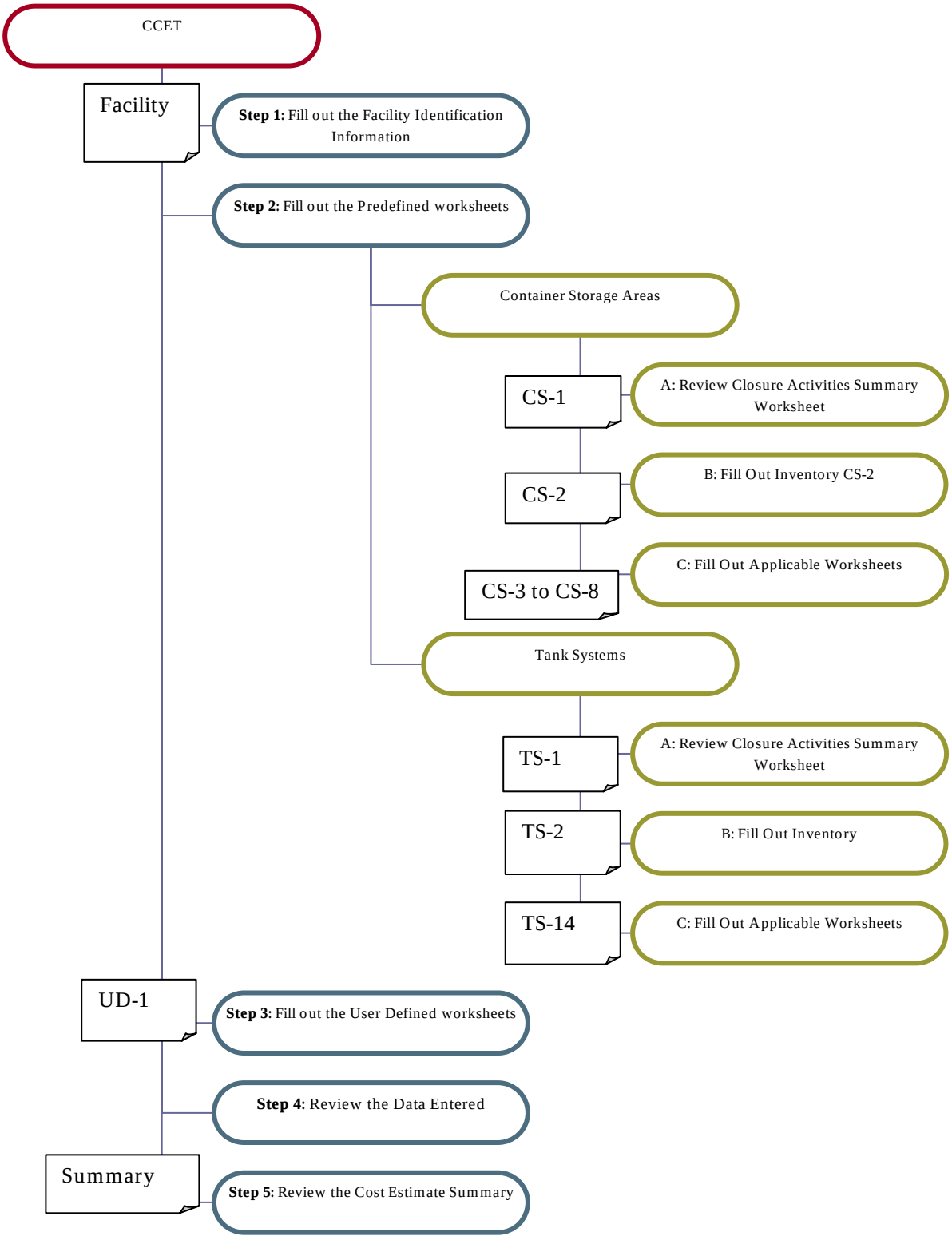



**Figure 9: Step by Step Guide to creating a Closure Cost Estimate**

# SECTION 4: Creating a Closure Cost Estimate using CCET

## Step 1: Fill out the Facility Identification Information

This worksheet is used to collect information on the geographic location of the facility as well as contact information of the individual creating the closure cost estimate.

*Note: The first three digits from the facility location zip code are used to calculate the localization factor[9] for the closure costs. All costs in CCET are bare national averages. Material, labor and equipment costs can be adjusted on the basis of their location by multiplying the bare national cost by the localization factor.*

## Step 2: Fill out the predefined Worksheets

CCET has two predefined types of units – Container Storage Areas and Tank Systems. The methodology used to calculate closure costs is identical for both of these units though the contents and inputs used are different.

### A: Review the Closure Activities Summary Worksheet

Users should first review the closure activities summary sheet CS-1 (Figure 9) and TS-1 (Figure 10). These sheets contain a list of closure activities that will be performed on each unit and provide links to each of the supporting worksheets. Depending on the facility, all or some of these closure activities may be required.[10]

[9] Localized Cost = Bare National Cost X Localization Factor.
Localization Factor for Washington State taken from R.S. Means, *Environmental Remediation Cost Data – Unit Price*, 11th Annual Edition, 2005 (pages 1-33).

[10] The activities shown in normal type are most frequently needed as part of closure. The facility owner/operator may intend or be required to conduct additional activities to close the unit. Worksheets for estimating the costs of these additional activities are listed in *italic type.*

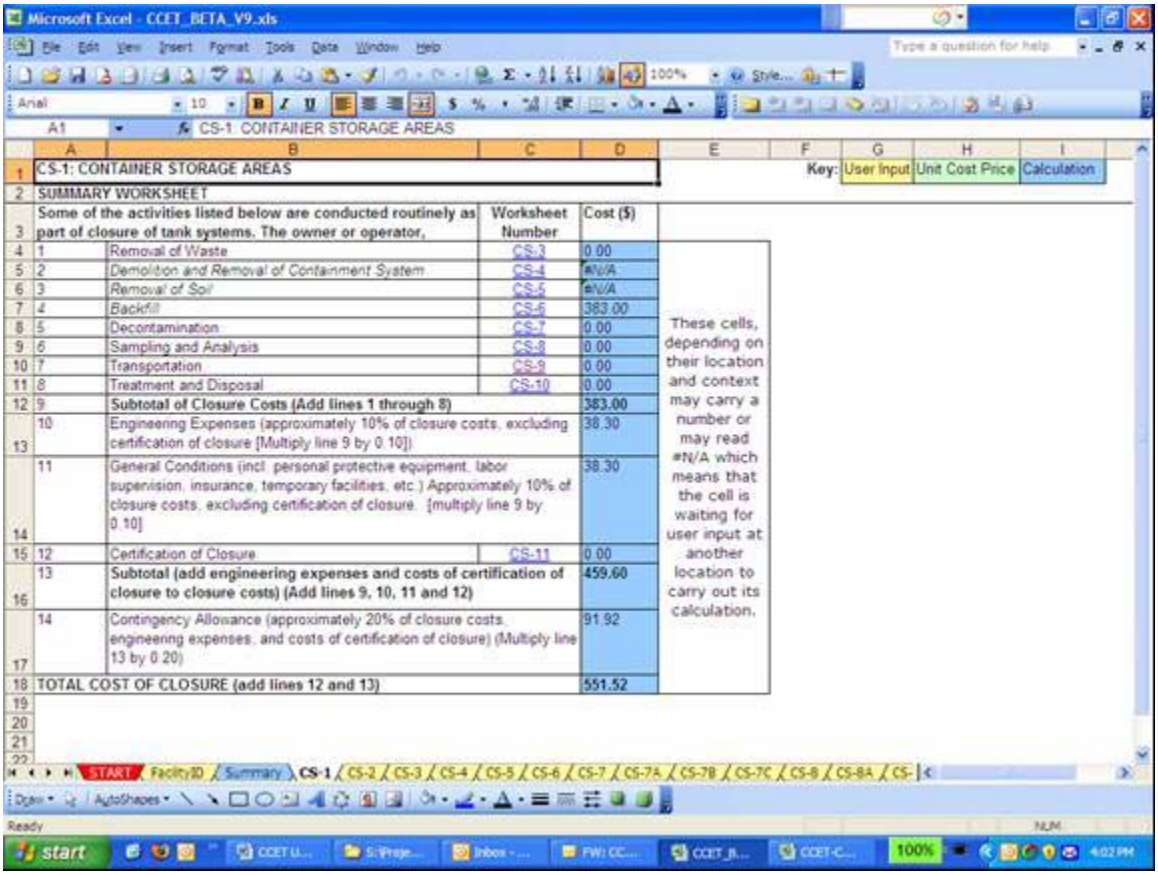



**Figure 10: Container Storage Areas Summary Worksheet**

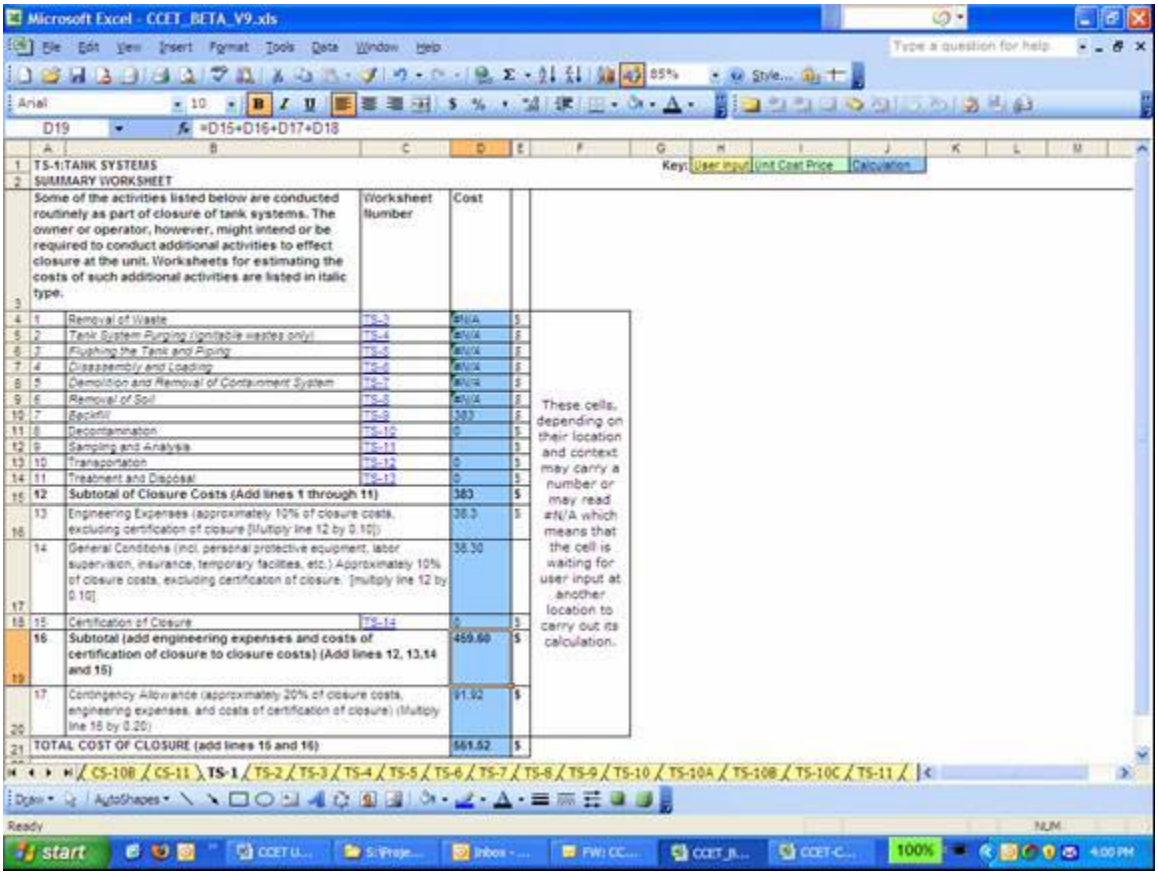


**Figure 11: Tank Systems Summary Worksheet**

### B: Fill out the Inventory worksheet

The inventory worksheets require the user to enter information about the physical infrastructure present at the facility for Container Storage Areas (CS-2) and Tank System (TS-2). The values entered in the infrastructure worksheets are automatically carried forward to the applicable supporting worksheets and are used in conjunction with unit costs and other user input to estimate costs.

### C: Fill out Applicable Worksheets

Users should fill out the remaining applicable worksheets based on their judgment of which of the closure activities apply to their units. At the bottom of every predefined spreadsheet, room is allotted for the user to add any other activity that was not included in the predefined worksheet. The cost entered here is automatically added to the total cost for that activity.

## Step 3: Fill out the User Defined Worksheet

The User Defined worksheet (UD-1) can be used to include additional closure costs that are unique to the facility and do not fit into any of the predefined container storage areas and tank system worksheets. The user can fill out the spreadsheet any way they choose and no restrictions have been placed on any of the cells. The only constraint is that the total cost from user-defined closure activities should be placed in the Total Cost cell shown in Figure 11. The number entered here will be included in the total closure cost. Though this worksheet does not impose any structural constraints, users are strongly encouraged to show all calculations and reference unit cost sources to backup cost justifications.

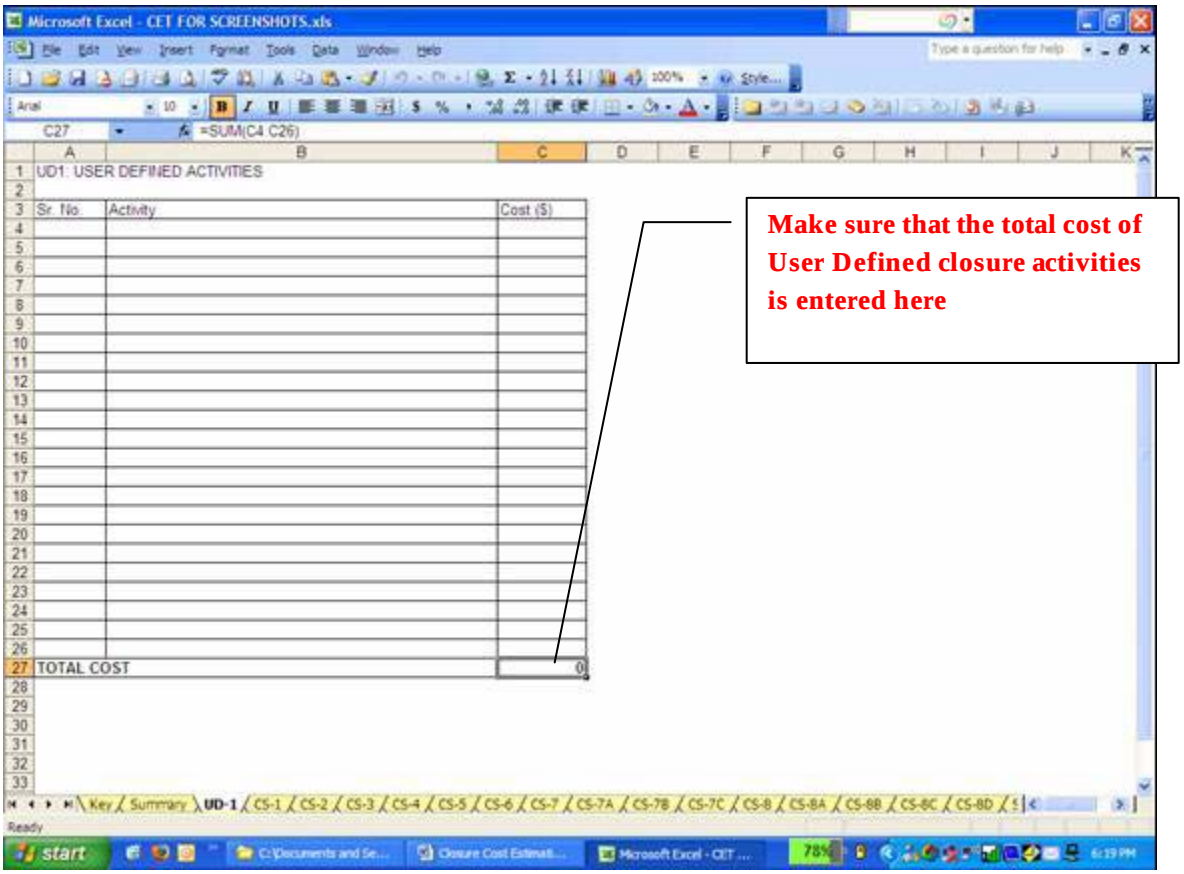



**Figure 12: User Defined Closure Activities**

## Step 4: Review the Data Entered

The 'User Data Summary' Worksheet summarizes all the data entered by user in the other worksheets. Users are encouraged to use this worksheet to review their data entry

and make corrections as necessary in the corresponding worksheets by clicking on the appropriate link in the summary sheet as shown in Figure 12:

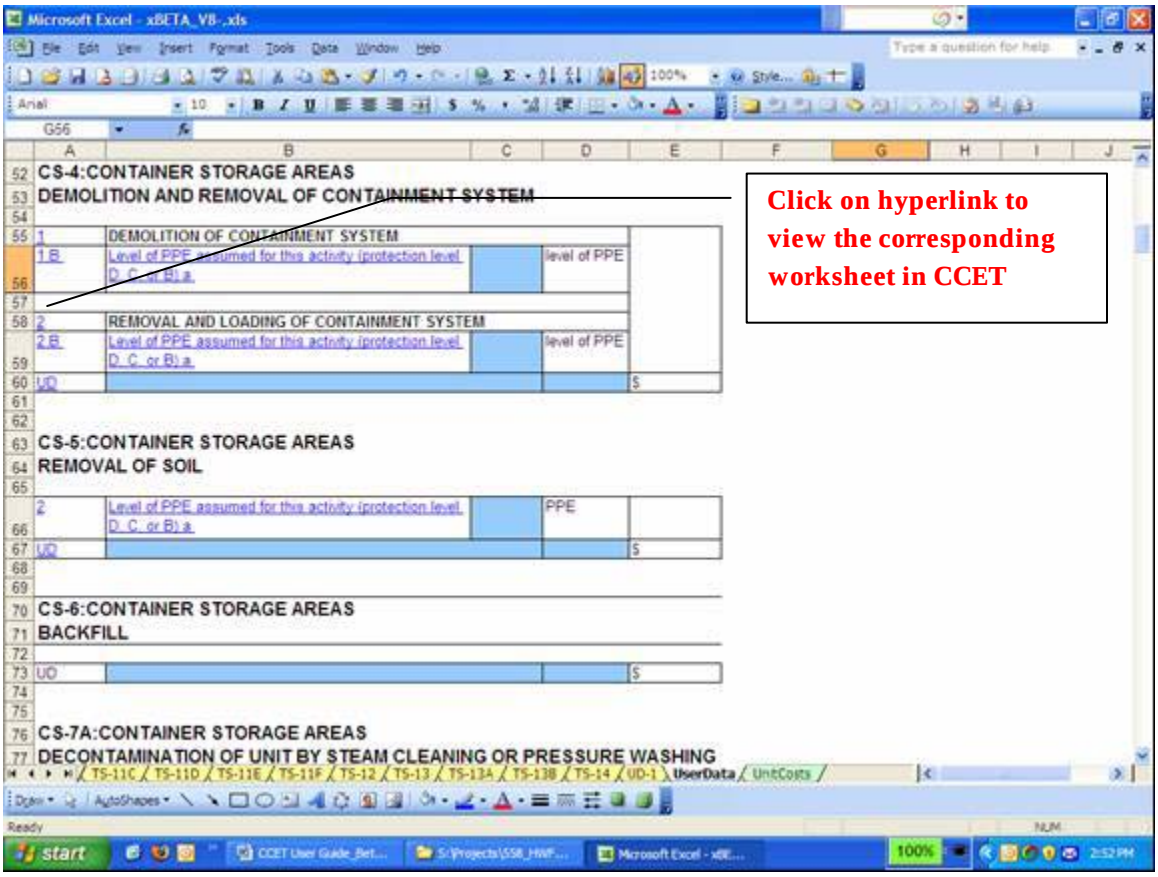



**Figure 13: User Data Summary**

## Step 5: Review the Cost Estimate Summary

Users should review the final cost estimate for the facility in the Summary Worksheet. As shown in Figure 13, the Facility Summary sheet includes the total cost of closure of each the predefined units (container storage areas and tank systems) and the user defined units. The summary sheet also includes the localization factor, which when applied gives the total cost to close the facility for that particular location in the country.

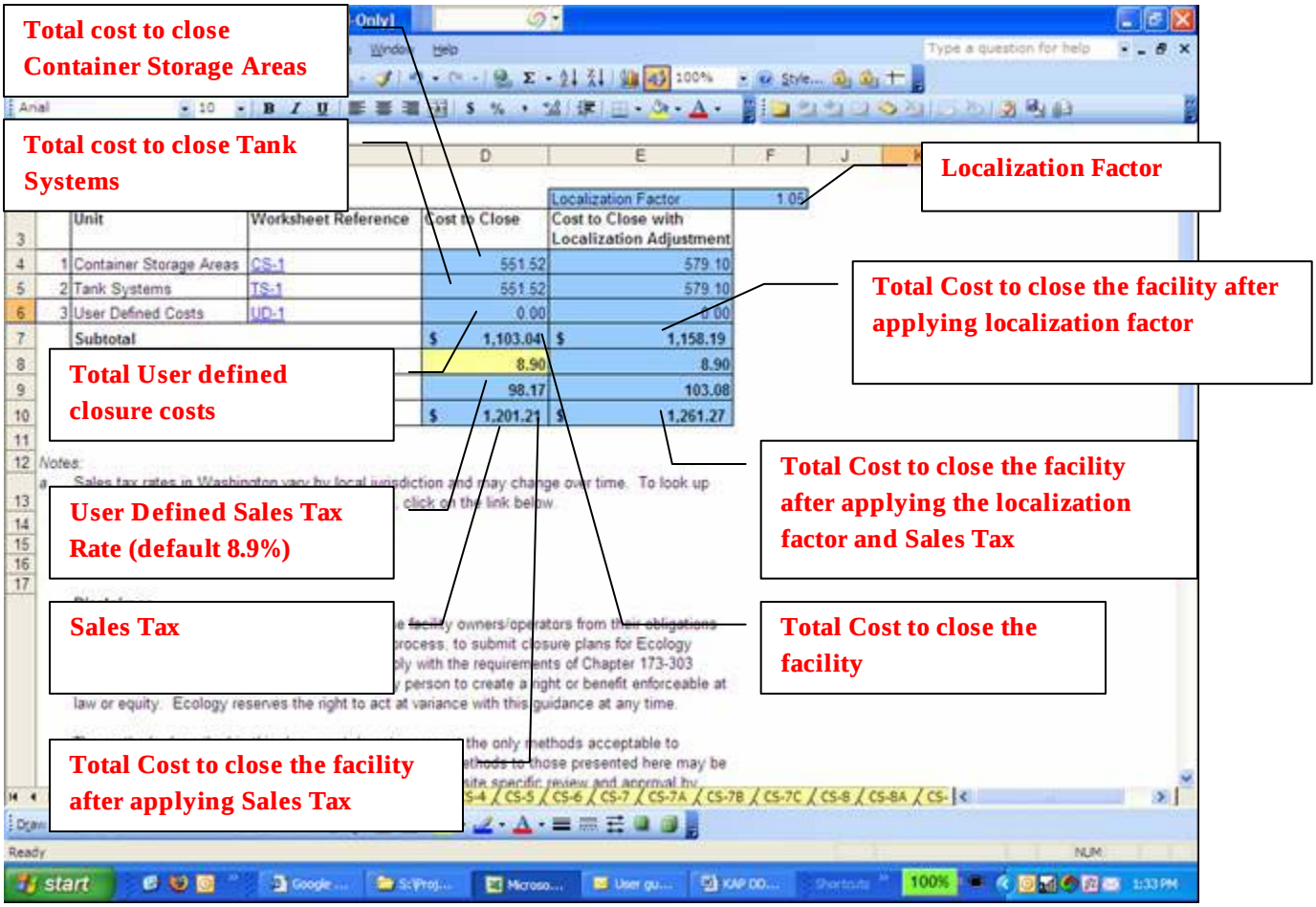



**Figure 14: Facility Summary**

# Appendix A: Unit Price Calculations

The Unit Costs and work rates used by CCET were calculated using the following sources:

- R.S. Means, *Environmental Remediation Cost Data – Unit Price*, 11th Annual Edition, 2005
- R.S. Means, *Building Construction Cost Data*, 63rd Annual Edition, 2005
- R.S. Means, *Environmental Cost Data – Assemblies*, 11th Annual Edition, 2005
- U.S. Environmental Protection Agency, Final Guidance Manual: Cost Estimates for Closure and Post-Closure Care Plans (Subparts G and H), January 1987, EPA/530-SW-87-009.

## Adjustment for Safety Level

CCET makes the assumption that workers encumbered by Personal Protective Equipment (PPE) cannot perform activities at the same rate as workers who are not encumbered and that the safety level has an impact on the productivity of labor and equipment. CCET accounts for three levels of safety: B, C and D based on the Occupational and Safety and Health Administration (OSHA) regulations in 29 CFR Part 1910. The relevant section[11] of the regulation has been reproduced below:

**Part Number: 1910**
**Part Title: Occupational Safety and Health Standards**
**Subpart: H**
**Subpart Title: Hazardous Materials**
**Standard Number: 1910.120 App B**
**Title: General description and discussion of the levels of protection and protective gear.**

**II. Level B protection should be used when:**

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection.

[11] http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9767

2. The atmosphere contains less than 19.5 percent oxygen; or

3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

Note: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

**III. Level C - Level C protection should be used when:**

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;

2. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and

3. All criteria for the use of air-purifying respirators are met.

**IV. Level D - Level D protection should be used when:**

1. The atmosphere contains no known hazard; and

2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Note: As stated before, combinations of personal protective equipment other than those described for Levels B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

CCET using the following methodology[12] to calculate the costs at the three selected safety levels D, C and B

[12] R.S. Means, Environmental Remediation Cost Data – Unit Price, 11th Annual Edition, 2005, pages 1-20.

| Safety Level | Labor Productivity | Equipment Productivity |
|---|---|---|
| B | 50% | 60% |
| C | 60% | 75% |
| D[13] | 100% | 100% |

For each of the activities, the CCET Unit Price worksheet lists the labor and equipment costs at each of the PPE levels. The example below outlines how the Labor and Equipment Cost per work hour for demolition and removal of the containment system were calculated for safety levels B, C and D.

| Sheet Reference | Base Price | Safety Level | | |
|---|---|---|---|---|
| CS-4-1.C[14] | | B | C | D |
| Total Cost | **46.69** | **92.30** | **76.74** | **46.69** |
| Labor | 43.45 | 86.90 = Base Price/0.5 | 72.42 = Base Price/0.6 | 43.45 = Base Price/1 |
| Equipment | 3.24 | 5.40 = Base Price/0.6 | 4.32 = Base Price/0.75 | 3.24 = Base Price/1 |

## Finding the Unit Cost Prices in CCET

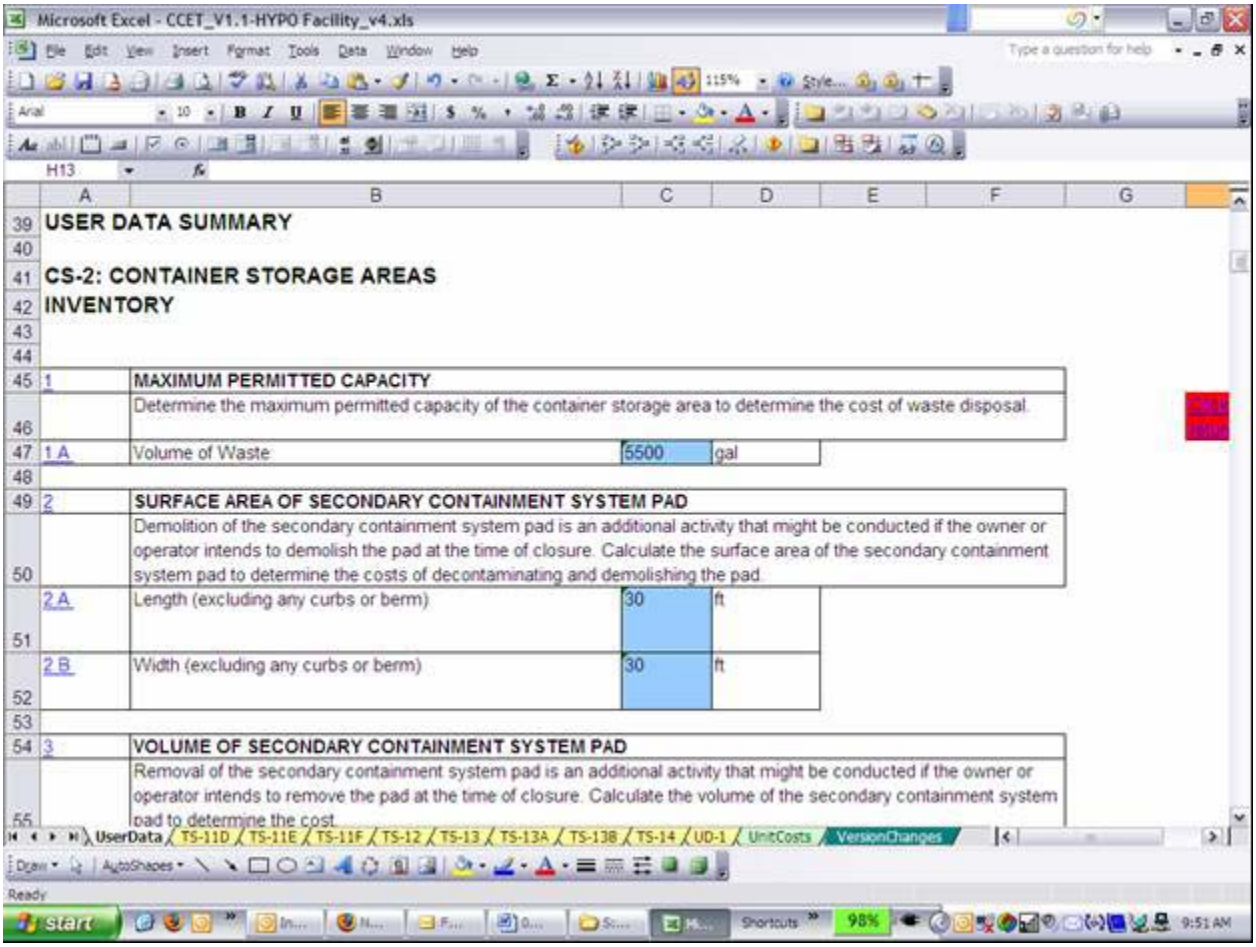
Each of the unit price cells in the CCET worksheets links to the corresponding cost in the Unit Price worksheet and are referenced by the worksheet and line number. The Unit Prices worksheets lists each of the unit prices at the different safety levels, the units used and the reference book and page number from which the costs were derived.

[13] CCET assumes that safety level D is the same as safety level E in the R.S. Means, Environmental Remediation Cost Data – Unit Price, 11th Annual Edition, 2005, pages 1-20.

[14] CS-4 is the "Demolition and Removal of Containment System" worksheet, and line 1.C is the "Labor and Equipment Cost per Work Hour" cell.

# Appendix B: User Data Entry Fields

The data entered by users is summarized in the User Data Summary worksheet in CCET. A screenshot of the worksheet is given below. Please refer to the CCET tool for a complete list of the User Data entry fields.



# Appendix C: Examples

Two examples of how CCET can be used have been included in the package. Hypothetical facilities were created that best represent potential closure activities and costs for used oil processors and dangerous waste treatment and storage facilities.

**Hypothetical Facility 1: Small Used Oil Processor**
File Name: HypFac1.xls

**Hypothetical Facility 2: Commercial Dangerous Waste Treatment and Storage Facility**
File Name: HypFac2.xls